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SUMMARY WITH CRITICAL APPRAISAL

Trimmed Peripherally Inserted Central Catheters for Hospitalized Neonatal Patients: A Review of Safety and Guidelines

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Abbreviations

RCT	randomized controlled trial
PICC	peripherally inserted central catheters

Context and Policy Issues

Peripherally inserted central catheters (PICC) are thin tubes inserted for central venous access. They are minimally invasive and used where longer-term intravenous access is required to administer therapeutic needs such as fluids or medications. PICC use has increased in the past decade,¹ because of the relatively low cost and ease of placement compared to other catheters.²

While their popularity has grown, PICCs are associated with potential complications. Venous thrombosis, infections, or extravasation into a body cavity and tamponade are known adverse effects with potentially fatal results.³ Further, catheter failures can include accidental removal, tip migration and fracture.⁴ Compared to adults, inserting and maintaining PICCs in small infants presents specific challenges due to smaller vessel and catheter diameters,⁵ with the potential for more safety concerns.

PICCs are generally the venous access method of choice for long term access in neonates despite the risk of complications.⁵ PICCs have enabled advances in care for this population, replacing catheters that would have needed insertion by a surgeon.⁶ However, previous studies have demonstrated the potential for complications.⁷⁻⁹ For example, in the U.S., a five-year study found complication rates of 27% in upper extremity PICCs, and 21% in lower extremity PICCs among 559 neonates.¹⁰

Reducing catheter length may lower the risk of certain complications though there is limited literature. A 2019 study found a longer external PICC length was associated with significantly higher odds of bloodstream infection.¹¹ As such, the need to trim catheters to mitigate against adverse events such as migration or breaking has been suggested as part of standard insertion procedures.^{12,13}

While promising, the safety of trimming PICCs for neonates is itself unclear. An adult study found an increased risk of deep vein thrombosis when catheters were trimmed,¹⁴ but evidence in younger populations has not been compiled. Given the popularity of use and potential for complications associated with PICCs, this review aims to assess the safety and evidence-based guidelines of trimming PICCs in the neonatal population.

Research Questions

1. What is the clinical safety of trimmed peripherally inserted central catheters among hospitalized neonatal patients?
2. What are the evidence-based guidelines regarding the use of trimmed peripherally inserted central catheters among hospitalized neonatal patients?

Key Findings

No evidence regarding the safety of peripherally inserted central catheters among hospitalized neonatal patients or evidence-based guidelines on their use was found.

Methods

Literature Search Methods

A limited literature search was conducted by an information specialist on key resources including PubMed, the Cochrane Library, the University of York Centre for Reviews and Dissemination (CRD) databases, the websites of Canadian and major international health technology agencies, as well as a focused Internet search. The search strategy was comprised of both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were trimmed peripherally inserted central catheters and neonatal patients. No filters were applied to limit retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2014 and August 28, 2019.

Selection Criteria and Methods

One reviewer screened citations and selected studies. In the first level of screening, titles and abstracts were reviewed and potentially relevant articles were retrieved and assessed for inclusion. The final selection of full-text articles was based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Hospitalized neonatal patients (i.e., within the four weeks of birth)
Intervention	Trimmed peripherally inserted central catheters
Comparator	Q1: Non-trimmed peripherally inserted central catheters Q2: No comparator
Outcomes	Q1: Safety/harms, e.g., infection control, catheter fracture, catheter migration, dislodgment Q2: Evidence-based guidelines and recommendations
Study Designs	Health Technology Assessments/Systematic Reviews/Meta-Analyses, Randomized Controlled Trials, Non-Randomized Studies, Guidelines

Exclusion Criteria

Articles were excluded if they did not meet the selection criteria outlined in Table 1, they were duplicate publications, or were published prior to 2014. Guidelines with unclear methodology were also excluded.

Critical Appraisal of Individual Studies

No relevant studies or guidelines were identified.

Summary of Evidence

Quantity of Research Available

A total of 338 citations were identified in the literature search. Following screening of titles and abstracts, 327 citations were excluded and 11 potentially relevant reports from the electronic search were retrieved for full-text review. 14 potentially relevant publications were retrieved from the grey literature search for full text review. Of these potentially relevant articles, all publications were excluded for various reasons. Appendix 1 presents the PRISMA¹⁵ flowchart of the study selection.

Additional references of potential interest are provided in Appendix 2.

Summary of Findings

Safety of Trimmed PICCs in Neonatal Populations

No evidence regarding the safety of PICCs among hospitalized neonatal patients was found.

Guidelines

No guidelines regarding the safety of PICCs among hospitalized neonatal patients were found.

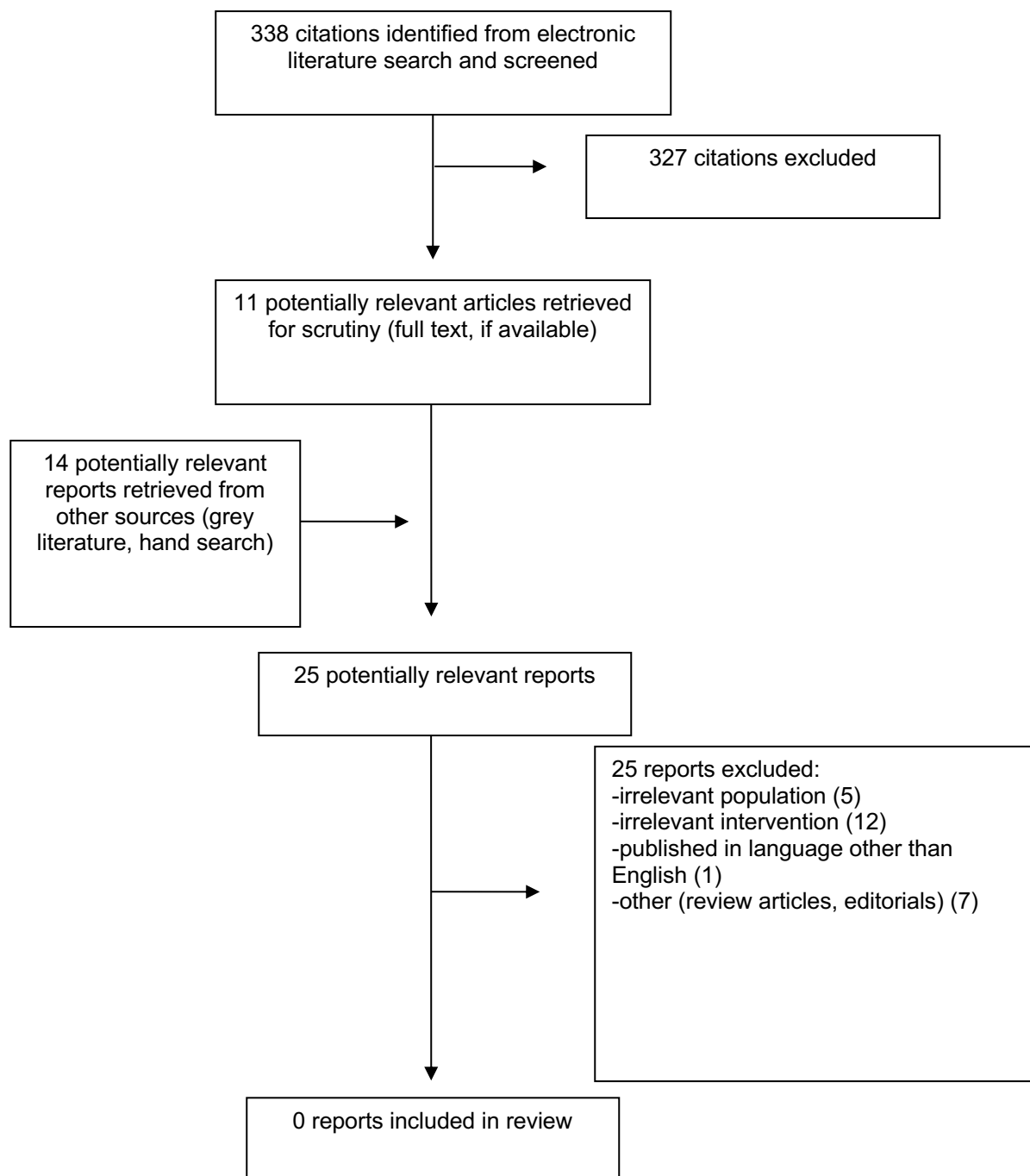
Conclusions and Implications for Decision or Policy Making

It was not possible to determine the safety of trimmed peripherally inserted central catheters for use in hospitalized neonatal patients. No relevant evidence-based guidelines were identified. Future studies are needed to assess safety outcomes of this technology.

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Appendix 1: Selection of Included Studies



Appendix 2: Additional References of Potential Interest

Adult population

Steele D, Norris CM. Cutting peripherally inserted central catheters may lead to increased rates of catheter-related deep vein thrombosis. *J Infus Nurs*. 2014 Nov-Dec;37(6):466-472.

Guidelines without recommendations related to trimmed PICCS (though mentions them)

Mason Wyckoff M, Sharpe EL. Peripherally inserted central catheters: guideline for practice, 3rd ed. Chicago (IL): The National Association of Neonatal Nurses; 2015: http://hummingbirdmed.com/wp-content/uploads/NANN15_PICC_Guidelines_FINAL.pdf.

Notes: See Table 1. Section 13: Preparing the Catheter (p. 29)